

Attorney Docket No. 97-2RCE5  
Patent Application Serial No. 08/847,967

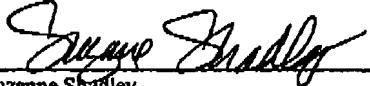
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BY:

  
Suzanne Shadley

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Goldwasser et al.

Serial No.: 08/847,967

Filed: 4/22/97

For: The Combinatorial Synthesis Of  
Inorganic Or Composite Materials

Confirmation No.: 2173

Group Art Unit: 1639

Examiner: Epperson

Santa Clara, California  
April 10, 2007

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

DECLARATION OF JOHN A. REED

UNDER 37 C.F.R. §1.132

I, John A. Reed, hereby declare as follows:

- 1) I am the President of The Reed Company, at 745 Distel Dr., Suite 123, Los Altos, CA 94022. I own no Symyx common stock and have not received Symyx stock as part of my compensation. I make this declaration in support of Applicants' response to the issues raised by the Office.
- 2) I graduated from University of California at Berkeley, with a M.S. in Electrical Engineering in 1965 and from the same school with a B.S. in Electrical Engineering in 1962. I have worked in the field of semiconductor memories for more than 40

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years and believe that I am considered an industry pioneer in the architecture, design, and development of semiconductor memories. As an electronic engineer, I've designed, and reviewed and critiqued designs of, SRAMs, DRAMs, ROMs, and EEPROMs. I have also been a circuit designer, device technologist and product developer, including the first commercial DRAM that I developed for Intel in 1970. In fact, that particular device was heralded by Intel as the "first semiconductor memory to replace magnetic core," as its selling price was then competitive on a price per bit basis with magnetic core, the type of memory disclosed in the "Pohm et al." reference cited by the Examiner in this case.

- 3) I am a named inventor on 14 issued U.S. patents, most of which are related to semiconductor memory techniques, including US 3,550,097 issued in 1970, entitled "DC Memory Array;" US 5,204,836 issued in 1993, entitled "Method and Apparatus for Implementing Redundancy in Parallel Memory Structures;" US 5,065,055 issued in 1991, entitled "Method and Apparatus for High-Speed BI-CMOS Differential Amplifier with Controlled Output Voltage;" US 4,679,171 issued in 1987, entitled "MOS/CMOS Memory Cell;" US 4,667,311 issued in 1987, entitled "Dynamic RAM with Reduced Substrate Noise and Equal Access and Cycle Time;" US 4,025,907 issued in 1977, entitled "Interlaced Memory Matrix Array Having Single Transistor Cells;" and US 3,937,983 issued in 1976, entitled "MOS Buffer Circuit." My CV is attached hereto as Exhibit A.
- 4) I have reviewed the October 12, 2006 Office action, specification, currently pending claims, and the Pohm et al. reference in the above-identified patent application.
- 5) I have read the claims in this patent application (e.g., independent claim 42 together with claims depending therefrom) and see that they are directed to methods for making an array of diverse materials, the method comprising forming ten or more inorganic materials on ten or more predefined discrete regions of a rigid substrate, respectively, each of at least ten of the materials being different from each other and being formed by a method that comprises delivering a first component of the material

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to the respective predefined discrete region of the substrate to form a first solid layer of the first component on the substrate, delivering a second component of the material to the respective predefined discrete region to form a second solid layer of the second component on the first layer, and varying the composition, concentration or thickness of the delivered first or second components between respective regions, the substrate comprising a sufficient amount of space between the ten or more regions such that the delivered components do not substantially interdiffuse between the ten or more regions of the substrate.

- 6) I have read the statements in the October 12, 2006 Office action regarding the disclosure of the Pohm et al. reference. In my opinion, the Pohm reference discloses an experiment for exploring a variety of different thin film magnetic memory geometries on the same die where a single wafer comprised of a number of these dice can be processed to evaluate different parameters associated with the arrays. Table I defines a range of values Pohm considered to be reasonable for different materials required, including a Cr layer that could be expected to be in the range of 100-300 angstroms, permalloy (Ni-Fe) that could be in expected to be the range of 1000-1500 angstroms, Cu in the range of 5000-1500 angstroms, Ti in the range of 200-400 angstroms, and then another layer of permalloy (Ni-Fe) in the range of from 1000-1500 angstroms. These were the 5 materials disclosed and I believe Table I shows the ranges that Pohm considered reasonable for the thicknesses of these various layers. To implement the experiment Pohm discloses would require processing a number of wafers using normal masking techniques to define the experimental die in multiple locations on each wafer. In particular Pohm disclosed 4 different pitches for sense digit lines which comprised copper coils that wrap around the die in question, 3 turn coils on 8 mil centers and 5 turn coils on 12 mil, 16 mil, and 18 mil centers. In the word line direction, Pohm discloses a set of 1 mil lines with 3 mil spacing, another set of 2 mil lines with 4 mil spacing, another set of 3 mil lines with 5 mil spacing, and finally, a set of 4 mil lines with 6 mil spacing.

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- 7) It is important to note that Pohm's article proposes building a plurality of *identically* patterned dice, each with the variety of geometries discussed in the prior paragraph, on a single wafer. (See Pohm Figure 1a) Each die of the plurality of dice contained on each processed wafer, would have *identical* film thickness parameters, at least within the range of normal processing tolerances. Thus, to set film thickness parameters at some certain values and process wafers with techniques available to Pohm in 1969, each die on any given wafer would have virtually identical film thickness characteristics; in order to obtain experimental test devices with differing film thickness parameters would require processing separate wafers differently (i.e., by varying deposition times) to obtain the different results.
- 8) In my opinion, Pohm's objective is disclosing this experiment was to be able to apply these experimental structures in each die and experimentally determine by the combinations of the layer thicknesses shown in Fig. 1 (as evaluated from appropriately differently processed wafers) along with the sense digit line and word line pitches shown in Fig. 2 to find an optimal a thin film memory device to yield maximum performance from the smallest possible memory cell. Examples of how this optimization would be done are shown in Fig. 3, which shows that the signal from the memory cell with a 1 mil word line are very much smaller than the cell with the 2 mil word line.
- 9) If one were to look at the variability of the parameters in Table I of Pohm, while there would be a normal variability of the thicknesses, in order to experimentally create a measurable difference in thicknesses of the layers, would require the making of different wafers, as noted above. Using the evaporation rates disclosed in Pohm Table I, for example, if the permalloy (Ni-Fe) evaporation rate was 30 Å/sec., then to achieve a 1000 angstrom thickness would require about 33 sec, while it would take approximately 50 sec to obtain a thickness of 1500 angstroms. Thus, to obtain dice of different permalloy thicknesses would require the creation of 2 different wafers and exposing the different wafers to the deposition at the different times to give the different thicknesses. My understanding of the pending claims is that one creates a

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single wafer (substrate) containing different materials with different film thicknesses in adjacent cells, a concept not disclosed or contemplated by Pohm. It is my opinion that the thicknesses indicated in Table I of Pohm were intended as guidelines to show ranges over which various layer thicknesses could be made for normal operation of memory working cells. For example, in the 3<sup>rd</sup> paragraph from the bottom of p. 410, Pohm discloses that a 1200 angstrom permalloy layer was optimal, meaning that this was accurately measured. In contrast, Table I showed that a range of thicknesses that could be employed.

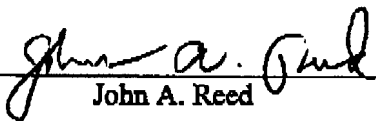
- 10) The Table created by the Examiner at pages 3-4 of the Office action of October 12, 2006 is not disclosed by Pohm. In my opinion, this table is speculation that Pohm would have had the ability to vary the thicknesses between dice on a single wafer. For example, site number 1 in the Examiner's table has a 1500 angstrom Ni-Fe layer, which would require 50 seconds deposition time, and site number 3 in the Examiner's table has a 1000 angstrom Ni-Fe layer, which would require only 33 seconds of exposure to the sputtering source. But Pohm neither disclosed nor suggested any ability to deposit to only one site, so Pohm's dice all would necessarily have the same thicknesses. Assuming the Examiner's Site 1 and Site 3 were manufactured on the same wafer, and both exposed in a vacuum environment to a sputtering source at the same time, Site 1 and Site 3 would be exposed for the same time. So, after 33 seconds have elapsed to properly deposit the correct 1000 angstrom thickness for Site 3, Site 1 hasn't reached its target, so deposition would perforce be continued for the additional time needed to achieve its required 1500 angstrom thickness. But, by that time, Site 3 would have the same film thickness as Site 1!
- 11) In my opinion, the only practical way of implementing the different combinations of experimental thicknesses set forth by the Examiner in his inventive table, using technology available to Pohm in 1969, would have been to separately process a number of different wafers, *one wafer for each different table entry*, to be able to evaluate the range of film thickness parameters. This is clearly in contrast to the

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inventive technique of the application's disclosure, whereby all of those differing film thickness parameters could have been realized in different areas of the *same wafer*.

12) I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that the statements herein were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of the above-identified application or any patents issuing thereon.

Date: April 4, 2007

  
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John A. Reed

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Patent Application Serial No. 08/847,967

**EXHIBIT A**

***Curriculum Vitae of John A. Reed***

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**EMPLOYMENT HISTORY:**

**The REED Company (April 1986—Present)**

- Testified at depositions, Markman hearing, tutorial hearing, juried trials and before ITC Administrative Law Judges.
- Wrote & published tutorials on DRAM, SRAM, EPROM, EEPROM technology for client litigants for expert reports and courtroom demonstratives.
- Assisted lawyers & engineers with several semiconductor & computer firms in developing infringement and validity positions in licensing and litigation activities
- Wrote expert position papers for licensing, and expert reports/declarations for litigation
- Principal Expert Witness on Anti-Infringement for major Japanese respondent in ITC case between TI, complainant, and nine foreign co-respondents
- Circuit expert for major 2006 ITC hearing on behalf of complainant in patent infringement/validity case involving FLASH memory circuits and architecture
- Principal designer of SRAM cache elements for state-of-the-art RISC machines

**VISIC, Inc. (November 1983—April 1986)**

- Co-Founder/V.P. Engineering — Developed cost, yield, and production flow models for First-Round business plan; \$4.5 M was raised. Managed company's design and CAD technology development.
- Architected and Developed VISIC's first two DRAM's: The V64H1 & V16H4, two 35 NS "Hierarchical" RAM's
- Established & managed the implementation & usage of VISIC's CAD system
- Directed establishment & operation of State-of-the-Art memory test center
- Established product engineering capability
- Wrote application notes & technical briefs

**RAMPOWER, Inc. (June 1974 — November 1983)**

President, Senior Consultant — MOS/CMOS DRAM, SRAM, & non-volatile technology development. Some contributions to a sampling of clients:

**BURROUGHS CORPORATION: (1974—77)**

- Co-invented "Folded Bit Line" Memory Architecture
- Invented industry's 1st Dynamic Sense Amp
- Developed 4K DRAM device — First to apply folded bit line

**NATIONAL SEMICONDUCTOR CORPORATION: (1974—82)**

- Personally designed 4K DRAM device — "National's most successful development"
- Consulted on 16K-256K DRAM, various SRAM devices, as well as yield improvements
- Advised on management issues

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**EMPLOYMENT HISTORY: (Cont'd)**

**HUGHES AIRCRAFT: (1981—83)**

- Single-handedly solved SOS SRAM problem related to fundamental transistor structure

**LOCKHEED MISSILES & SPACE COMPANY: (1981—83)**

- Invented & developed CMOS/MNOS means for replacing plated-wire memories.

**NCR CORPORATION: (1981)**

- Short (3-day) visit: 64K dynamic ROM was fraught with problems; Recommended list of changes which client implemented to convert yieldless ROM into production device

**American Microsystems, Inc. (1972 —1974)**

- Designed minicomputer DRAM memory systems
- Designed  $\mu$ Processor-based intelligent terminal system
- Gave invited paper on " $\mu$ Processors in Display Terminals", IEEE workshop, 1973
- Product-engineered AMI DRAMs & ROMs

**Intel Corporation (1970 —1972)**

- Designed, characterized & brought i1103 to market — 1st Core-competitive DRAM
- Designed i2102, 1st 1K SRAM — helped spawn  $\mu$ Processor revolution
- Developed i2105, High-speed mainframe Pseudo-SRAM

**American Microsystems, Inc. (1968 —1970)**

- Designed industry's first TTL compatible "large" ROM: 2560 Bits
- Managed joint development program between Shell Oil, SRI, AMI:
  - Resulted in original "Balanced Sense Amp" patent (Christensen)
  - Developed 1T Cell memory array test devices
  - Developed one of industry's first transient circuit simulators (MOSCAP)

**PATENTS HELD:** 14 Patents awarded, as inventor or co-inventor

**EDUCATION:** B.S.E.E. and M.S.E.E., University of California, Berkeley

**HONOR SOCIETIES:**  $\Phi$ BK (Phi Beta Kappa), HKN (Eta Kappa Nu), TBII (Tau Beta Pi)

**PROFESSIONAL ORGANIZATIONS:** Member, IEEE; Member and Diplomat,  
American Board of Forensic Examiners


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Suzanne Shadley

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Confirmation No.: 2173

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Group Art Unit: 1639

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Examiner: Epperson

For: The Combinatorial Synthesis Of  
Inorganic Or Composite Materials

Santa Clara, California  
April 10, 2007

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION OF DANIEL M. GIAQUINTA****UNDER 37 C.F.R. §1.132**

I, Daniel M. Giaquinta, hereby declare as follows:

- 1) I am a Distinguished Scientist/Group Leader, Heterogeneous Catalysis at Symyx Technologies, Inc., 415 Oakmead Parkway, Sunnyvale, CA 94085. My previous position was Group Leader, Electronic and Related Materials. I own Symyx common stock and receive stock as part of my compensation at Symyx. I make this declaration in support of Applicants' response to the issues raised by the Office.
- 2) I graduated from Massachusetts Institute of Technology with a Ph.D. in Chemistry in 1993 and from Northwestern University with a Bachelor of Arts in Chemistry 1989. I

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worked as a Visiting Fellow at the Institut des Matériaux de Nantes, France in 1994-95 and as a Postdoctoral Researcher at Argonne National Laboratory in 1995-1996. I have worked in the field of synthesis and characterization of arrays of inorganic materials for more than 10 years, and have significant experience in the areas of inorganic synthesis, physical vapor deposition, and structural, magnetic, and electrochemical characterization of solids.

- 3) I have authored or co-authored over 40 publications, including more than 20 US and foreign patents and patent applications, many of which are related to high throughput synthesis, methods and equipment. Examples include: U.S. Patent 7,166,470 to Giaquinta et al., issued January 23, 2007, and entitled "Preparation of combinatorial arrays of materials using solution-based methodologies"; U.S. Patent 6,875,717 to Lugmair et al., issued April 5, 2005, and entitled "Method and System For The In Situ Synthesis Of A Combinatorial Library Of Supported Catalyst Materials"; U.S. Patent 6,850,002 to Danielson et al., issued February 1, 2005, and entitled "Light Emitting Device For Generating Specific Colored Light, Including White Light"; and U.S. Patent 6,758,951 to Giaquinta et al., issued July 6, 2004, and entitled "Synthesis and Characterization of Materials For Electrochemical Cells". My CV is attached hereto as Exhibit A. I joined Symyx in 1997.
- 4) I have reviewed the October 12, 2006 Office action, the currently pending specification and claims, the Pohm et al. reference, the Kitada et al. reference, the Maxwell et al. reference and US patents 4,780,848 and 5,420,819, both of which include A. Pohm as an inventor and relate to technical areas described in the Pohm et al. reference.
- 5) As I read the claims in this patent application (*e.g.*, independent claim 42 together with claims depending therefrom) I understand that they are directed to methods for making an array of diverse materials, the method comprising forming ten or more inorganic materials on ten or more predefined discrete regions of a rigid substrate, respectively, each of at least ten of the materials being different from each other and

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being formed by a method that comprises delivering a first component of the material to the respective predefined discrete region of the substrate to form a first solid layer of the first component on the substrate, delivering a second component of the material to the respective predefined discrete region to form a second solid layer of the second component on the first layer, and varying the composition, concentration or thickness of the delivered first or second components between respective regions, the substrate comprising a sufficient amount of space between the ten or more regions such that the delivered components do not substantially interdiffuse between the ten or more regions of the substrate.

- i) Additionally, claim 43 requires screening the at least 10 different materials and determining the relative performance of the at least 10 different materials with respect to the property of interest.
  - ii) Additionally, claim 46, and dependent claims, requires that the various components deposited in the manner of claim 42 interact (claim 46), interact by intermingling, interdiffusing, interspersing, doping, implanting, interpenetrating, condensing or fusing (claim 47), interact, without reaction, by intermingling, interdiffusing, interspersing, doping, implanting, interpenetrating, condensing or fusing (claim 48) to form materials.
  - iii) Other independent claims 68, 70, 72 and 74 have different limitations than claim 42, but are directed toward a similar invention. For example, among other claim elements, claim 68 requires a rigid substrate, claim 70 requires five layers, claim 72 requires interaction between the layers and claim 74 adds the screening step.
- 6) I have read the statements in the October 12, 2006 Office action regarding the disclosure of the Pohm reference. In my opinion, the Pohm reference does not disclose what the Examiner asserts, and in fact, Pohm does not intend to disclose what the Examiner asserts is disclosed. In my opinion, Pohm does not disclose the table created by the Examiner on pp. 3-4. Furthermore, the Pohm reference in combination with the Kitada reference does not disclose what the Examiner asserts.

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- 7) In my opinion, Pohm does not disclose or suggest preparing arrays of diverse materials using a protocol that includes varying the composition, concentration or thickness of the *delivered (e.g., first or second) component, as compared between respective material-containing regions* – a step that is required by each of the claims defining the present invention. Also significantly, Pohm does not deposit components of materials into different regions of a substrate to form different materials, as required by the claims (e.g., claim 42 requires that “each of at least ten of the materials being different from each other”).
- 8) Table I of Pohm does not allow for any layer to be in any order (see p. 409, par. 3). Each layer has been deposited to perform a specific task; if a layer were to be omitted, the goal of demonstrating a “very high density DRO magnetic film memory array” (p. 408, par. 1, ln 5-6) may be unrealized. If a layer is deposited too thinly, for example, the function of the layer may be unfulfilled. If a layer is deposited more thickly, however, the device would still function in the same manner, although perhaps less efficiently. The Cr layer, for example, is a buffer layer between the layer-2 ferromagnet and the glass (p. 409, par. 3, ln 1-2). According to Pohm, the purpose of the Cr layer is to “increase adhesion between the glass substrate and the first permalloy layer and to increase the coercive force of the first permalloy layer.” In my opinion, that if Cr were another composition the explicit purpose of the Cr layer deposition may be unattainable. Layer 2 is a specific composition (permalloy: 81.5 mol% Ni and 18.5mol% Fe) with specific magnetic characteristics. I believe it cannot be implied that Pohm would intentionally vary the composition of the ferromagnet in his magnetic storage device. Continuing, layer 3 is copper, explicitly chosen for its high conductivity. As previously, in my opinion it would not be likely that the Cu layer would be modified to another composition, especially due to the fact that Pohm noted that the substrate temperature was kept to a minimum to avoid Cu diffusion (p. 409, par. 3, ln 11-13). The purpose of layer-4 Ti is also explicitly defined by Pohm (p.409, par. 3, ln 9-11). While multiple storage cell structures were prepared (p. 409, par. 2, ln 1), the role of each layer remained the same indicating that *any* layer order or a random layer order would not be feasible.

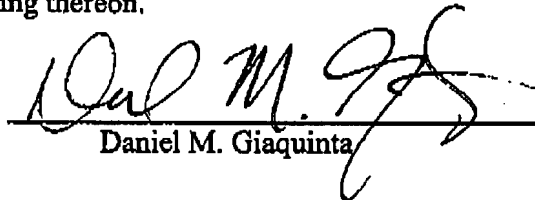
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- 9) In my opinion, Table I in Pohm discloses that only the same components and the same materials are made in each cell and that the ranges in Table I (e.g., 100-300 Cr) are not compositional ranges for different regions of the wafer. The only difference between the regions of Pohm are the physical size of the regions, which is a result of the different spacings in both the word and digit line directions to create "different sized storage cells" (see bottom of second column of page 408 in the sentence that carries over to page 409). As a result, the materials in each region of Pohm are not different on the basis of the composition, concentration or thickness of the delivered (e.g., first or second) component, as required by the claims.
- 10) In the Kitada reference it is disclosed that under the correct conditions, reaction may occur between permalloy layers and other metals in intimate contact with the permalloy layers. Kitada further disclosed that the reaction between the permalloy and Cu or Cr, for example, was readily apparent through the examination of several characteristics such as coercivity, depth-composition profile and microstructure. Kitada studied each of these characteristics for permalloy in contact with 6 metal films as a function of temperature. Kitada delineated the temperature limits beneath which no reaction occurs and above which ever increasing reactivity may be expected. For both Cr and Cu (Ti was not studied) the temperature of reactivity for a system similar to that of Pohm was determined to be higher than any temperature utilized by Pohm. In other words, Pohm (as stated on p. 409, par. 3, ln 11-13) intentionally remained below the temperature required to result in chemical reactivity as determined by Kitada. Pohm states that the temperature was "kept lower than usual" at 150° C to "keep copper recrystallization and diffusion to a tolerable level." Kitada states that "even after annealing at 200° C, no changes in coercivity were detected" for any metal (p. 175, par. 1, ln 3-4), and "no mutual diffusion occurred below 300° C (for Cr, p. 176, par. 2, ln 3) and below 250° C for Cu,
- 11) I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further,

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that the statements herein were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of the above-identified application or any patents issuing thereon.

Date: April 10, 2007

  
Daniel M. Giaquinta

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**EXHIBIT A**

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***Curriculum Vitae of Daniel M. Giaquinta*****PROFESSIONAL EXPERIENCE****Symyx Technologies, Inc. (January 1997 – Present)**

- Group Leader, Heterogeneous Catalysis
  - Led technical research programs for the discovery of new catalysts in the areas of hydrodesulfurization, hydrodewaxing and fluid catalytic cracking
- Group Leader, Electronic and Related materials
  - Led technical research programs in the areas of automotive and portable fuel cells, batteries, spintronics, and phosphors relating to lighting and signage

**Argonne National Laboratory (February 1995 – January 1997)**

- Conducted successful immobilization and speciation of  $(\text{UO}_2)^{2+}$  and  $\text{Th}^{4+}$  cations in hydrophobically surface-modified clays and zeolites under hydrothermal conditions.

**Institut des Matériaux de Nantes, France (November 1993 – October 1994)**

- Conducted research in the areas of synthesis, single-crystal structure, magnetic and electronic characterization of unique reduced manganese and vanadium silicates and rare earth transition metal germanates.

**EDUCATION****Massachusetts Institute of Technology (1989-1993)**

Ph.D., 1993, Inorganic/Solid State Chemistry. Synthesis, structure and magnetic characterization of new, layered main group-transition metal oxides, Professor H.C. zur Loye, Research Advisor

**Northwestern University (1985-1989)**

B.A. (Honors) in Chemistry, 1989. Professor Kenneth Poeppelmeier, Research Advisor.

**PUBLICATIONS: 25**

**PATENT HELD:** 10 US and international patents awarded and 15 published patent applications

**HONORS**

- Postdoctoral Fellow, Loire-Atlantique, France
- Solid State Gordon Conference Fellowship
- Merck Award, Northwestern University
- Phi Eta Sigma Honor Society
- Alpha Lambda Delta Honor Society

**PROFESSIONAL AFFILIATIONS**

- Materials Research Society
- American Ceramics Society
- Société Française de Chimie
- Sigma Xi
- American Chemical Society